MAR 1952

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25X1A

REPORT NO.

CD NO.

COUNTRY	USSR	DATE OF INFORMATION	1949
SUBJECT	Scientific; Biographic - Mathematics		
HOW PUBLISHED	Monthly periodical	DATE DIST.	31 Mar 1953
WHERE PUBLISHED	Moscow	NO. OF PAGES	4
DATE PUBLISHED	Feb 1949		
LANGUAGE	Russian	SUPPLEMENT TO REPORT NO.	

ILLEGIB

THIS IS UNEVALUATED INFORMATION

SOURCE Matematika v Shkole, No 2, 1949, pp 45-47.

CAREER OF MORDUKHAY-BOLTOVSKOY, MATHEMATICIAN AND TEACHER

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Dmitriy Dmitriyevich Mordukhay-Boltovskoy was born 27 July 1876 to a well-known railroad-transport engineer in the district town of Pavlovsk in Peterburgskaya Guberniya.

Before the age of 10, he studied at home; afterward he studied at the First Classical Gymnasium at Peterburg.

After finishing his secondary school training in 1894, at the age of 16, Mordukhay-Boltovskoy studied mathematical physics at Peterburg University. Here his unusual mathematical propensities and understanding of scientific problems attracted the attention of the outstanding professors of the university, including A. A. Markov and K. A. Posse. At the recommendation of the faculty, Mordukhay-Boltovskoy remained at the university in 1898 to prepare himself for a professorship on the faculty of pure mathematics. However, at the end of the year, the young student accepted an appointment as assistant to the Russian scientist, Professor G. F. Voronov, at Warsaw Polytechnical Institute. While there, he prepared for his master's examination, which he passed brilliantly in 1900 - 1901, at the age of 25.

Through with examinations, Mordukhay-Boltovskoy began developing his intensive scientific activity. As a result, he published in 1902 in the Reports of the Khar'kov Mathematical Society his first work, an original interpretation of Abel's famous theorem.

When (1906) he presented his massive 400-page master's dissertation, he had already published six works. His dissertation "On Reducing Abelian Integrals to Lower Transcendentals" presented an essentially new method of reduction which gave an interpretation to the derivations of Poincare-Picard, a solution to Schwartz's problem relative to the transformation of Abel's integrals, and derivation of the conditions governing the existence of the algebraic solution of Euler's general equation.

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A direct result of his work as an assistant was his "Systematic Collection of Elementary Exercises in Differential and Integral Calculus" (1904). This large collection of quite original problems was a masterful realization of the author's mature and interesting pedagogic ideas, which were expounded in detail in the introduction.

In 1907, Mordukhay-Boltovskoy was sent with a small group of scientific workers from Warsaw to Novocherkassk to teach at the newly organized Don Polytechnical Institute, where, in the following year 1908, he was made professor.

However, the scientific interests of the 32-year old professor caused him to think of returning to Warsaw, which was one of the few centers of research activities in Russia of that period. At the competition of 1909, he was chosen professor extraordinary of Warsaw University and, after 3 years, ordinary.

Mordukhay-Boltovskoy's research work of the Warsaw period is concerned with broad investigations into the definite integration of transcendental functions and the solution of quadratic differential equations.

In 1913, at the age of 37, he solved the 22d problem of Hilbert by proving that a function given by a known series cannot be determined by an algebraic differential equation.

In the same year, he published his first findings on transcendental numbers (later supplemented in 1926). This was a serious approach to the solution of Hilbert's famous 7th problem. It was completely solved in 1934 by another Soviet mathematician, A. O. Gel'fond.

In the war year 1915, Warsaw University and its staff of professors and instructors were evacuated to Rostov-on-Don.

Mordukhay-Boltovskoy worked at Rostov University until it finally closed in January 1931. After this he was transferred to organize a pedagogic institute attached to the university. With reopening of activities at the university, Mordukhay-Boltovskoy was able to combine his scientific-pedagogic labors at the university and at the institute.

In 1935, the All-Union Certifying Board under the All-Union Commissariat of Higher Schools awarded him the learned degree of doctor of physicomathematical sciences without requiring him to defend a dissertation.

During the Rostov period, Mordukhay-Boltovskoy concentrated principally on the problems of the four-dimensional world and Lobachevskiy space. The geometry hall of the university was filled with Mordukhay-Boltovskoy's original models of multidimensional space, many of which served as original crystallized interpretations of unpublished articles. Much of his work on the geometry of construction was directly concerned with his interests.

During his investigations of algebraic curves, he found interesting generalizations of diametral and polar properties. His investigations in differential geometry dealt with problems of covering of surfaces and curvature of higher orders.

In the twenties Mordukhay-Boltovskoy became interested in aviation. In this new field, he made his first efforts in the mathematical biology of floating plants, seeds, winged animals, and birds. Soviet and foreign zoologists showed much interest in the work on the skeletal structure of radiolaria and particularly on the "extremal" problems connected with them.

Since Mordukhay Boltovskoy was an enthusiastic teacher, he attached much significance to his investigations of the history and methodology of mathematics.

He based his work on pedagogy on the following premise: The solving of an axiomatic-psychological problem requires method. This means that every school-type proof must be built only on those propositions which are definitely available to the student.

Hence, he attached great importance to the study of the psychology of learning and invention, particularly in mathematical thinking. In fact, one of his first pedagogic works (in 1912) was devoted to this problem: ("The Psychology of Mathematical Thinking," Voprosy Filosofii i Psikhologii, Moscow, September - October 1912, pages 491-534.)

Mordukhay-Boltovskoy believed that school geometry should be experimental and observational before becoming logical. ("Geometry as the Science of Space," Izvestiya Rostovskogo Pedinstituta, Volume X, 1940, page 10.) Before being able to work with abstract geometrical concepts, one must obtain them; this can be achieved by idealizing the proper real prototypes.

Mordukhay-Boltovskoy emphasized in his works that the history of mathematics be studied in secondary schools. By comparing the usual history textbook with data on the history of science, he came to the conclusion in 1912 that "the history of science in secondary schools is no less useful study than certain civil wars or palace intrigues." (Mordukhay-Boltovskoy, O Pervom Vserossiyskom S"yezde Prepodavateley Matematiki /The First All-Russian Congress of Instructors in Mathematics/, Warsaw, 1914, page 2.)

However, he was decidedly against substituting historical details for logical structure in teaching. Although he respected the mathematical historian, V. V. Bobynin, Mordukhay-Boltovskoy showed that he did not share Bobynin's opinion when he stated that "a pupil gains but little from the Indian rope, the ancient Greek star, the Roman 'groma' or the diopter of Heron of Alexandria." (Mordukhay-Boltovskoy, Vtoroy Vserossiyskom S"yezde Prepodavateley Matematiki /Second All-Russian Congress of Instructors in Mathematics/, page 58.)

Mordukhay-Boltovskoy thought that the history of the textbook should be studied to trace the lower strata of mathematical thinking, which would give methodologists many valuable ideas. Along with his study of textbooks, he made a thorough study of mathematical terminology.

He was an advocate of reforms in the teaching of mathematics in pre-Revolutionary Russia, and a participant in all-Russian congresses of instructors in mathematics and in the work of the Russian National Subcommittee for Teaching Mathematics. However, he was against extremes in achieving reforms. Thus, he was decidedly against including Lobachevskiy and Riemannian geometry in the secondary school program. While insisting on the inclusion of analytical geometry in the secondary school course, he would limit the teaching of mathematical analysis in secondary schools to "acquainting students with the ideas of functions through individual examples and with derivatives, and to presenting limit concepts in geometry to the notion of a sum of infinitely small numbers in such a way that the basic idea of integral calculus would become quite clear and definite." (Mordukhay-Boltovskoy, O Pervom Vserossiyskom S"yezde Prepodavateley Matematiki /The First All-Russian Congress of Instructors in Mathematics/, page 10.)

Mordukhay-Boltovskoy constantly tried to bring teachers together for creative discussions and always carefully listened to their comments. He untiringly urged teachers to creative teaching. He attached particularly great importance to the study of students' written work and to the classification of errors.

He would personally test his views on method to improve the teaching of mathematics in the various secondary schools. This was done by open discussions on the various general and specific problems of teaching of mathematics, under the active leadership at seminars on mathematics attended by eager teachers of progressive secondary schools. The many reports of the participants of these seminars enriched Soviet literature on methodology.

Mordukhay-Boltovskoy was already 65 when the Fatherland War of the Soviet people began. The old professor, while fulfilling his annual teaching load, asked in 1942 to be permitted to work without pay with correspondence school teachers. As he was leaving the institute, after his daily lecture, on 20 July, he was severely wounded by fragments from an enemy bomb, so that he had to spend almost a year in hospitals and to be evacuated from Rostov to Yessentuki. He was able to make his first painful steps on crutches only in 1943. In August 1943, he renewed his scientific-pedagogic work at Pyatigorsk Institute. In the summer of 1945, he was transferred to Ivanovo, being in need of the support and care of relatives living there, and in 1947 he returned to work in his native Rostov.

The Germans had burned the rich scientific archives of the old professor. But the Soviet scholar-patriot now in his 80th year has been able to summon enough enthusiasm and persistence to restore in a short period of time more than a hundred of his works in manuscript. Some of them have already been published in Doklady Akademii Nauk SSSR, Narodnoye Obrazovaniye (Public Education), Matematika v Shkole, and other Soviet publications.

Mordukhay-Boltovskoy has made available to Soviet readers a translation, with copious commentary, of Newton's mathematical works. Soon his translation of Euclid's "Elements" will also appear in the press.

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